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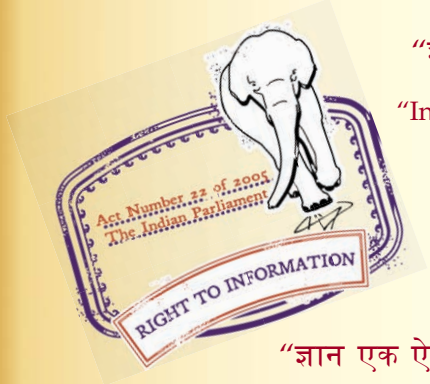

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GUIDELINES FOR SELECTION OF FISH HOLD INSULATION

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GUIDELINES FOR SELECTION OF FISH HOLD INSULATION

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Indian Standard

GUIDELINES FOR SELECTION OF FISH HOLD INSULATION

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 28 February 1983, after the draft finalized by the Fishing Vessels Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

0.2 Fish begin to spoil immediately after death. Efficient methods of preservation on board fishing vessels are necessary in order to land fish of good quality and permit long voyages. Since the rate of spoilage is largely dependent on temperature, increased by the increase in temperature, refrigeration of the catch is common practice. Fresh water ice has played and continues to play a major role in the chilling of fish on board because it has several advantages over other form of refrigeration. It involves no complication in the design and operation of the fish hold or storage space. It is important to remember that ice is still to be used against all surfaces to protect fish from incoming heat even when the fish holds are insulated.

0.3 Thermal insulation is achieved with a material having a high resistance to heat flow. It can be installed between the hull and the lining and over other surfaces to retard the flow of heat into the fish hold.

0.4 It is the responsibility of the user of this standard to ensure compliance with *Marine Products Export Development Authority Act, 1972* for registration of fishing vessels.

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1. SCOPE

1.1 This standard gives guidelines for selection of insulation materials and insulation practices to be used in fish holds.

2. FACTORS AFFECTING THE SELECTION OF INSULATION

2.1 Heat Gains — Since the purpose of insulation is to retard the heat flow, the sources of heat should be identified. Then the icing practice and

design of the fish hold can be made more effective. The usual ways for heat to enter the fish hold are as follows;

a) The fish ;

b) Bacterial and chemical action;

c) Electric apparatus;

d) Working personnels and frequency and duration of opening of fish hold hatch;

e) Air changes;

f) Pipes, stanchions, etc;

g) Bottom, sides and deckhead; and

h) Bulkheads.

2.2 Fish Hold Lining — The ideal lining for a fish hold should have the following properties:

a) It should be watertight;

b) It should have a hard and smooth surface which will not harbour bacteria and dirt;

c) It should be easy to clean;

d) It should be robust; able to withstand blows inflicted with pound boards, ice, axes, etc;

e) It should not contaminate the fish;

f) It should not give rise to corrosion; and

g) It should be light in weight.

2.2.1 The recommended materials for fish hold lining are waterproof timber, galvanized iron sheets, marine aluminium and glass reinforced plastics.

2.3 Presence of Water — The suitability of an insulation and the best method of insulation depend on the type of hull and type of lining. Often the lining is not watertight and there may be some leakage of water through the hull, so that the insulation is attacked by water and perhaps by rot. Further to this problem of water leakage, water vapours may also condense in the insulation on the inside of the hull or on the inside of the lining, depending on the temperatures. The presence of water in the insulation can reduce or destory its value. Therefore insulation materials which are impervious to water are most suitable. Care is to be taken to ensure waterproof sealing while installing lining.

2.4 Other Factors — While selecting the insulation material for the fish holds the following factors should also be considered:

a) Insulation shall be protected against the ingress of water;

b) Wood grounds for the fixing of insulation should be treated against rot;

c) Flammable materials should not be used in an insulation system, in order to keep fire risk at the minimum;

d) Generally the plastic materials do not burn readily but there is danger from toxic fumes from burning plastics;

e) Insulation for the floor of the fish hold shall have an adequate compressive strength, not less than ($20t/m^2$);

f) Hatch covers should be properly insulated, lined and it should be close fitting; and

g) Particular attention shall be given to insulation of bulkheads, especially bulkheads separating engine room from fish hold.

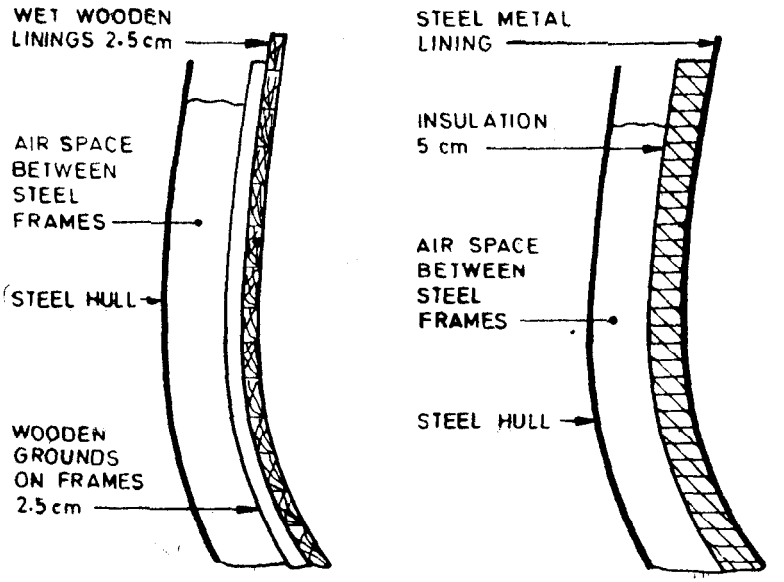
3. INSULATION MATERIALS

3.1 Cork, mineral wool, glass wool, expanded ebonite and expanded synthetic foams are some of the materials which are generally used for insulation of fish rooms.

3.1.1 Expanded materials with closed cell structure such as ebonite, polyurethone, polyvinylchloride and polystyrene which have low permeability to moisture are more suitable for fish holds. If this type of insulation is used under a wooden lining or another type of porous lining, the two should be separated by an air space ventilated to the fish hold. Otherwise the lining may become unduly wet and a source of odours and rot. There should be an air space, ventilated to outside atmosphere between the hull and insulation in wooden vessels.

Boundary bulkheads and decks of fish-rooms which are insulated with organic foam material shall be insulated to A-60 standard where they separate such spaces from machinery spaces, accommodation spaces, service spaces or control stations.

3.1.2 Expanded plastics of the open cell type, cork and wool insulations are at a disadvantage because they have high permeability. Systems which employ these materials shall include provisions to keep them dry or they will not remain effective for a reasonable period. Often the insulation is installed behind a watertight lining with a ventilated air space between the insulation and hull, as shown in Fig. 1,



a) HULL STRUCTURE WITHOUT INSULATION

b) HULL STRUCTURE WITH INSULATION

FIG. 1 FISHROOM INSULATION

3.1.3 When inflammable materials are selected for insulation purposes, a gas tight boundary shall be provided.

3.2 Properties — Steel has a low resistance to heat flow, dry wood has moderate resistance and cork has a high resistance to heat flow. An air space has an appreciable resistance, somewhat dependent on the amount of air circulation in the space and the reflective properties of the boundary surfaces.

3.2.1 The values of thermal resistance and other properties of various insulation materials are given in Table 1. These properties can vary a great deal depending on the density, method of manufacture and other factors.

3.2.2 Differences in ability to withstand rot and chemical attack are often not great enough to have a major bearing on the choice of insulation material. Cork is the least attractive of the materials given in Table 1 from this point of view. Only glass wool and mineral wool are virtually unaffected by fire and chemicals but their lack of rigidity and strength and high permeability are some of disadvantages. All expanded

plastics with closed cell structures have low permeability but are generally more expensive than the others. On the whole they are quite stable because they are impervious to moisture but adhesives used for fixing these materials should be chosen carefully if the fixing is to be secure.

3.3 Amount of Insulation — The amount of insulation required depends on a number of factors such as climate, vessel construction, method of stowage, length of voyage, etc. It is generally recommended that at least 5 cm of insulation should be sufficient giving an overall value of thermal resistance greater than 1·4 m^2 °C/W.

3.3.1 Solar radiation is an important factor, especially in tropical regions. The surface temperature of exposed deck and hull can rise to 20°C above the ambient temperature depending on the reflective properties of the surface.

3.3.2 As fish hold capacity is an important factor it may be better to use an insulation material of high thermal resistance than to use thicker sections of the one having low thermal resistance in order to achieve the same resistance to heat flow.

3.3.3 The engine room bulkhead is an important area to be considered for insulation. Very often it is poorly insulated or not insulated at all

TABLE 1 PROPERTIES OF INSULATION MATERIALS
(*Clause* 3.2.1)

Insulation Material	Density	Thermal Resistance for 5 cm Thickness, m^2 °C/W	Compressive Strength		Permeability to Water Vapour
	kg/m^3		KN/m^2	(t/m^2)	
Corkboard	150	1·40	500	(50)	High
	200	2·00	700	(70)	High
Glass wool	70	1·40	nil		High
Mineral wool	70	1·40	nil		High
Expanded polystyrene					
open cell	16	1·75	60	(6)	High
closed cell	30	1·50	250	(25)	Low
Expanded polyurethane	25	1·40	120	(12)	Low
Expanded	20	1·60	100	(10)	Low
Polyvinylchloride	40	1·60	300	(30)	Low
Expanded ebonite	70	1·75	300	(30)	Low
	200	1·25	1 200	(120)	Low